

THINKING ABOUT CAS WITHOUT THINKING ABOUT CAS DOCTRINE:  
SELECTED INTERACTIONS OF INSTITUTIONAL PROCESSES  
WITHIN THE CLOSE AIR SUPPORT MISSION

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by

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## ABSTRACT

THINKING ABOUT CAS WITHOUT THINKING ABOUT CAS DOCTRINE:  
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How should the joint force optimize the planning and execution of close-air support (CAS)? Previous studies have examined CAS from the perspective of service- and platform-specific procedures. This thesis examines how the joint force, as a cohesive whole, can more optimally deliver lethal firepower against any adversary. Using institutional analysis, three clusters of perverse incentives that hinder joint cohesion are examined. These clusters include: (1) the perverse incentives arising from rules of engagement intended to address the conduct of “operations amongst the population;” (2) the lack of interoperability arising from the multiplicity of service-specific platforms; and (3) the significant difference between training and real-world execution of CAS. This study reasons that institutions (which include rules, doctrine, practices, standard operating procedures, etc.) within each cluster generate unintended, path-dependent effects deleterious to cohesive joint air support. This thesis then proposes a new approach to CAS that mitigates these threats and better conduces to joint cohesion.

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## ACRONYMS

AO	Area of Operations
ATO	Air Tasking Order
CAS	Close Air Support
CIVCAS	Civilian Casualty(ies)
IAD	Institutional Analysis and Development
IAM	Inertially Aided Munitions
JCAS	Joint Close Air Support
JP	Joint Publication
JTAC	Joint Terminal Attack Controller
NATOPS	Naval Air Training and Operating Procedures Standardization
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
ROE	Rules of Engagement
TTP	Tactics, Techniques, and Procedures

## CHAPTER 1

### INTRODUCTION

Each Service organizes, trains, and equips to employ CAS within its roles as part of the joint force. As a result, a variety of aircraft are capable of performing CAS. The joint force commander (JFC) and his staff must be capable of integrating CAS capabilities into the concept of operations (CONOPS).

— Joint Chiefs of Staff, Joint Publication (JP) 3-09.3, *Close Air Support*

Close Air Support (CAS), is defined in JP 3-09.3, *Close Air Support* as “air action by fixed-wing and rotary-wing aircraft against hostile targets that are in close proximity to friendly forces, and requires detailed integration of each air mission with the fire and movement of those forces.”<sup>1</sup> From the advent of combat aviation through present times, CAS has been an integral part of the battlefield, bringing coordinated, massed firepower against the enemy and integrating with other combined arms functions in such a way as to leave the enemy exposed to one lethal action or another with no respite.

The wars in Iraq and Afghanistan—specifically Operations Iraqi Freedom (OIF) and Enduring Freedom (OEF)—were the proving grounds for many of the evolutions of CAS over the last decade. Through lessons learned and the application of progressive tactical thinking, United States (U.S.) and coalition forces worked in harmony to support the troops on the ground and bring death to the enemy from multiple avenues.

CAS has indeed evolved since the advent of armed aviation. U.S. forces now apply it more jointly than ever before, but though doctrine is clear on how CAS should be conducted, there are still a host of Tactics, Techniques, and Procedures (TTP)—both among American and multinational forces—that are out of alignment with respect to published doctrine. Simply put, each service, and more specifically individual units



within each service, conduct CAS in a slightly different fashion despite the doctrine defining it. These differences may come in the form of Standard Operating Procedures, theater Rules of Engagement (ROE), and individual experience on the part of operators. Chapter 4 will examine some of these departures from doctrine and explain why they undermine the intent of standard CAS doctrine promulgated in JP 3-09.3.

CAS doctrine places responsibility for the conduct of the attack squarely on the shoulders of the terminal controller, with input as needed by the crew of the attacking aircraft. Uniform doctrine and sound TTP addressing deliberate and on-call CAS missions are essential in ensuring reliable, proficient application of integrated air power. The purpose of this thesis is to examine the CAS institution as a whole in order to address the viability of existing mechanisms and to propose—where applicable—new ones that more effectively homogenize operators’ understanding of how best to support troops on the ground and apply effective lethal and non-lethal effects against the enemy.

The crux of this study is the CAS institution itself, what defines it, and how actions by its cadres of actors lead to various outcomes. Some of these outcomes are predicated on doctrine itself—desired outcomes stemming from proper doctrinal execution. Other outcomes are unintended, and are equally as likely given the same backdrop. These unintended consequences and the perverse incentives that can cause them are a focus of this thesis. The institutional processes involved with CAS planning and execution, examined in this light, may illuminate future recommendations for how to improve the joint force’s ability to plan and execute this critical mission set.

Previous studies have examined CAS from the perspective of service- and platform-specific procedures. This study examines how the joint force, as a cohesive

whole, can more optimally deliver lethal firepower against any adversary. Using institutional analysis, this thesis examines three clusters of perverse incentives that hinder joint cohesion. These clusters include: (1) the perverse incentives arising from rules of engagement intended to address the conduct of “operations amongst the population;” (2) the lack of interoperability arising from the multiplicity of service-specific platforms; and (3) the significant difference between training and real-world execution of close-air support. This study reasons that institutions (which include rules, doctrine, practices, standard operating procedures, etc.) within each cluster generate unintended, path-dependent effects deleterious to cohesive joint air support. This thesis then proposes a new approach to CAS that mitigates these threats and better conduces to joint cohesion.

The advent of cutting-edge technology has generally outpaced the CAS institution’s capacity to adapt to it, despite the advantages. At its heart, CAS is a procedure-driven mission, resting its success or failure on the competence of its practitioners. The most capable terminal controller on the battlefield is rendered ineffective if strike aircraft arrive unprepared or insufficiently trained. The same holds true in reverse. The most capable aircrew on the battlefield cannot effectively support troops on the ground if the terminal controller is unable to nominate, designate, and prosecute targets with air power. Technology enables much greater access to information, which can build the situational awareness of both the terminal controller and the strike aircraft. However, for all the information available on the battlefield at any given time, procedures and doctrine must still transform that information into actions conducive to mission success.

The ubiquitous problem with procedures and doctrine is that human beings must translate them into physical actions. Ideally, the expected outcomes are already defined by the doctrine, but in reality, a multitude of factors within the environment also cast a vote in determining the outcome. The primary goal of this study is examining the CAS institution at large and analyzing the ability of each service component—Army, Navy, Air Force, Marine Corps—to be combat effective at CAS execution when operating jointly. In looking at the CAS institution as well as the doctrine, this study addresses the fundamental issue of whether or not current joint force application of CAS is adequate for the modern battlefield, or if practical application of CAS principles has outpaced the doctrine in use today.

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<sup>1</sup>Joint Chiefs of Staff (JCS), Joint Publication (JP) 3-09.3, *Close Air Support*, Defense Technical Information Center, 2009, [www.fas.org/irp/doddir/dod/jp3\\_09\\_3.pdf](http://www.fas.org/irp/doddir/dod/jp3_09_3.pdf) (accessed 3 April 2013), I-1, para. 2.a.

## CHAPTER 2

### LITERATURE REVIEW

Existing literature addresses aspects of the CAS mission from a variety of perspectives. Much of the most recent work examines advances in CAS application methodologies through Unmanned Aerial Systems, Precision Guided Munitions, and Digitally-aided Close Air Support, to name a few. Some also address the need for specialized systems and focused training to minimize “multi-role” saturation of the airborne operator, which leads to the question of true joint interoperability among all services. There is also a generally large body of work which takes on the question of joint interoperability from a doctrine standpoint, and whose arguments draw upon the so-called parochialism of individual service components as well as cases involving loss of life due to CAS execution failures. Though much of the existing work on CAS comes from military members closely involved with the actual CAS mission, there is little variance in the conclusions.

The existing body of work suffers from a limited pool of case studies that many authors examine in detail, but which yield very little new information. The fact that the lack of available case studies involving catastrophic mistakes or loss of life is a good thing; what is unfortunate is the lack of new perspectives previous authors have been able to provide given this limited information set.

The literature generally fails to address lasting mechanisms for long-term doctrinal congruence, owing to that assertion the fact that though existing doctrine has served generally well in the last decade or more, human error and a general failure to execute proper CAS procedures more often lead to the failures described in the current

body of work. Recent military operations in Iraq and Afghanistan do indeed continue to illustrate the need for effective deliberate and on-call skill sets to enable proficient, lethal application of force in order to shorten—as much as feasible—the kill chain.<sup>1</sup> Existing studies, however, do not examine the underlying institutional processes that govern the CAS environment in totality. It is here where this study will be unique. By examining the constituent parts of CAS, this study will make lasting recommendations for the future of the institution.

The RAND Corporation report for the United States Air Force, *Beyond Close Air Support: Forging a New Air-Ground Partnership*, specifically addresses the need for effective mechanisms geared toward the massing of air power against the enemy in support of troops on the ground. It also recognizes the fact that the need for deliberate, pre-planned fires is equally important to the basic need—indeed the true purpose for CAS—of providing on-call support on demand.<sup>2</sup> Some of the concepts in this report are dated in relation to the most current version of JP 3-09.3, but the conceptualization of the integrated CAS fight offered by RAND is germane to the discussion at the tactical and institutional levels. Integration of Army fire support under a true CAS umbrella is also particularly relevant to any discussion on how the whole of the joint force should approach applying a universal joint doctrine to this critical skill set.

The RAND report also addresses the shift in the Army to modular, agile battlefield forces like the Brigade Combat Teams, whose reorganization in terms of organic fires available to each unit practically necessitates augmentation with inorganic (i.e., CAS) fires.<sup>3</sup> Whereas Wilde, mentioned previously, adequately explains the shift in priority of aviation fires from the deep fight to the close fight, he fails to address the

potential shortfalls in firepower that could be augmented with fixed-wing CAS fires.<sup>4</sup>

The now-resolved gap in Joint Terminal Attack Controllers (JTACs) addresses the concern in this report that centers of excellence in charge of this training would be under significant strain to provide appropriately qualified personnel to provide CAS integration in brigade combat team maneuver units.

The School of Advanced Military Studies monograph “Will Close Air Support Be Where Needed and When to Support Objective Force Operations in 2015?” augments the literature by exploring past, present, and future concerns from an employment perspective, and should provide significant insight on where CAS doctrine came from, and where it is now.<sup>5</sup> This piece of literature is important because it examines CAS doctrine and recommendations from a decade-old perspective and draws conclusions based on where we are today. CAS doctrine has evolved since then, but not as much in substance. Comparing the conclusions drawn from the 2002 monograph to today’s doctrine, the next logical step is to build on those past assertions, compare them to the present, and then offer a new approach to examining CAS toward the goal of reaching relevant conclusions for the next decade and beyond.

Another important aspect of the literature in considering the far-reaching effects of future CAS recommendations is the effectiveness of tasking vehicles like the Air Tasking Order (ATO) and the Joint Tactical Air(strike) Request. A Naval Postgraduate School thesis titled “Weapon-Target Pairing: Revising an Air Tasking Order in Real-Time” offers that there are more efficient means of getting appropriately proportioned effects on target without enduring the tedium of the 72- to-96-hour ATO planning cycle.<sup>6</sup> An analysis of this work will help form the basis for recommendations on shortening the

kill chain as well as how to do that with a fully integrated palette of CAS assets. Current use of the ATO and Joint Tactical Air(strike) Request mechanisms sometimes result—at least in OIF/OEF—in redundant, time-late support requests that fail to adequately position assets for on-call missions with the appropriate weapon payload. Coordination through the Control and Reporting Center enables a variety of coalition strike assets to receive and execute real-time tasking on demand. The Control Reporting Center, through advances in wide-reaching communications technology, is able to relay time-sensitive information to already airborne assets and re-role them from ATO tasking in order to provide critical support to ground forces. One logical question to consider when discussing tasking vehicles is whether CAS as we know it today is an adequate one-size-fits-all tool for any conflict. Manipulation of the tasking vehicle itself may provide the flexibility required in terms of supporting a wide variety of conflicts with air-delivered fires.

Some existing studies on CAS during the early days of OIF address two key issues highlighted in this thesis. In “Close Air Support in the Low Intensity Conflict,” Michael Binney examines the training and execution disparities between American service components, and why they lead to deleterious circumstances in CAS execution. Additionally he examines cases of fratricide in the context of providing lasting solutions to becoming a more effective joint force on the battlefield.<sup>7</sup> His work assists this study in that it asks and answers key questions, which form the basis for this study, but it does little more than highlight the human errors and basic execution failures, which led to catastrophic situations in which friendly troops lost their lives. Unfortunately, as with many of the works reviewed for this study, it does very little to provide recommendations

of any substance. The body of literature, as it pertains to avoiding unfavorable results during CAS execution, seems more inclined to simply say with one voice: “follow JP 3-09.3 and all will be well.”

One very important aspect that this study will expand upon is Binney’s specific focus on CAS case studies, particularly those in Afghanistan and Iraq, which draw a distinction between CAS in support of unconventional warfare (i.e., Special Forces, Sea Air Land Teams, etc.) and CAS in support of a conventional fight. Operations in Afghanistan today are a mix of conventional and unconventional warfare, with the emphasis being on the former rather than the latter. His analysis of the unintended consequences of CAS execution related to fratricide are also germane, as this study will draw upon some well-documented examples of CAS errors resulting in friendly loss of life. Although this study will avoid the obvious topic of adherence to doctrine, it will instead examine the institutional factors that lead to failures.

Binney further argues that current training regimens are adequate for stand-alone operations involving one service component, but that they fall short when operating jointly. This assertion further draws upon the common argument that the different services exercise a sort of parochial, territorial mindset in how they interpret CAS TTP and subsequently train to them. This is simply not true; Joint Close Air Support (JCAS) doctrine may have aspects, which are open to semantic interpretation, but the method of execution is quite clear. Like many other works pertaining to CAS, this one also fails to provide an adequate basis for the assertions it makes, and instead offers only that the joint force should be more vigilant in the execution of its existing doctrine.



Ultimately, the existing body of literature solely on the topic of CAS appears to end at this level of analysis (i.e., doctrine, training, joint execution, and relevant case studies). A notable exception, which examines CAS as a part of operations in Afghanistan from 2001 to 2011, is Robert M. Cassidy's *War, Will, and Warlords: Counterinsurgency in Afghanistan and Pakistan*, which posits that improperly arrayed forces, armed with a thin understanding of counterinsurgency tactics and relying too heavily on air power, detracted from integrated operations and shifted the burden for offensive operations to attack aircraft. This work is particularly interesting from an institutional perspective, as it forms a foundation for identifying the perverse incentives of using CAS as a one-size-fits-all tool for any tactical situation rather than ground units maneuvering to close with and destroy the enemy.

This thesis will use this body of knowledge to form a foundation for institutional analysis in order to provide a perspective not yet realized in existing studies. Whereas the predominance of the body of work on this topic focuses on doctrine, execution, or technology, an analysis of institutional processes could certainly provide fresh context for future studies on CAS, whether they be focused on doctrine, training, or execution.

The major focus of this analysis will draw upon existing institutional research by applying the Institutional Analysis and Development (IAD) framework in examining the CAS institution as a whole. *The Samaritan's Dilemma* provides much of the underlying framework and practical application of the IAD framework, and the accompanying article "Background on the Institutional Analysis and Development Framework" by Elinor Ostrom expounds on the IAD framework and provides another set of practical examples.

The IAD framework provides appropriate context for examining the institutional underpinnings of CAS, to include the actors, rules, environment, and the interaction of all these variables within collective action situations. The two previously mentioned works, however, require some thoughtful consideration in order to fit the IAD framework to a purely military skill set and the unique collective action problems extant in military operations.

### Summary

This chapter described how previous authors have addressed CAS from a variety of perspectives: technology, tactical execution, and joint interoperability. Although many military writers closely involved with the CAS mission attempted to offer long-term mechanisms to make the mission more efficient and less prone to human error, dated case studies and ineffective analyses fail to strike at the heart of the larger issue pertaining to the health of CAS as a functional mission, which this study asserts is institutional in nature. The next chapter will describe how this thesis will arrive at significant conclusions and recommendations by first qualitatively examining the foundations of CAS, and then applying the IAD framework to examine CAS as a cluster of interrelated institutions. Following that, chapter 4 will examine three specific subsets of the CAS mission, forming the foundation for cogent recommendations in chapter 5.

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<sup>1</sup>Kill Chain: the length of time between target nomination and successful engagement of that target.

<sup>2</sup>Bruce R. Pirnie, Alan Vick, Adam Grissom, Karl P. Mueller, and David T. Orletsky, *Beyond Close Air Support. Forging a New Air-Ground Partnership* (Santa Monica, CA: RAND Corporation, 2005), [www.rand.org/content/dam/rand/pubs/monographs/2005/RAND\\_MG301.pdf](http://www.rand.org/content/dam/rand/pubs/monographs/2005/RAND_MG301.pdf) (accessed 3 April 2013), xiii-xx.

<sup>3</sup>The use of the term “inorganic” in a military sense is in reference to forces, effects, or capabilities not present within the element in question. For example, whereas Navy strike-fighter aircraft are “organic” to the Carrier Strike Group, Navy theater reconnaissance assets would be “inorganic” to the Carrier Strike Group.

<sup>4</sup>Patrick R. Wilde, “Close Air Support versus Close Combat Attack”( Monograph, School of Advanced Military Studies, Ft. Leavenworth, KS, 2012), [www.dtic.mil](http://www.dtic.mil) (accessed 3 July 2013), 21-22, 25.

<sup>5</sup>Bryan K. Luke, “Will Close Air Support Be Where Needed and When to Support Objective Force Operations in 2015?” (Monograph, School of Advanced Military Studies, Ft. Leavenworth, KS, 2002), [www.dtic.mil](http://www.dtic.mil) (accessed 3 April 2013), ii.

<sup>6</sup>Brian Zacherl, “Weapon-Target Pairing: Revising an Air Tasking Order in Real-Time” (Thesis, Naval Postgraduate School, Monterey, CA, 2006), [www.dtic.mil](http://www.dtic.mil) (accessed 3 April 2013), v, xv-xvi, 2-7.

<sup>7</sup>Michael W. Binney, “Close Air Support in the Low Intensity Conflict” (Thesis, Naval Postgraduate School, Monterey, CA, 2003), [www.dtic.mil](http://www.dtic.mil) (accessed 21 August 2013), v, 19-29, 42-53.

## CHAPTER 3

### METHODOLOGY

The previous chapter examined the existing body of work pertaining to CAS, identifying both effective and ineffective studies on the topic. In order to make effective use of this existing work, the conclusions and recommendations of past analysts should mesh with current analysis based on a methodology best suited to draw appropriate conclusions. This chapter will outline how the work highlighted in chapter 2 will be transformed into fresh, meaningful analysis for this thesis by introducing basic, qualitative analysis of existing data and applying a cutting-edge scholarly methodology for examining CAS as an institution: the IAD framework. This analysis will employ the IAD framework to examine why interactions of action groups within collective action situations lead to suboptimal outcomes. It is the disparity between intended and unintended outcomes that will lead to an understanding of how to make lasting recommendations for future study or for the future health of the CAS institution.

This institutional approach will examine three distinct subsets of the CAS environment within the bounds of this framework. Those three subsets are: (1) the (ROE) governing the CAS environment during armed conflict; (2) the lack of interoperability arising from the multiplicity of service-specific platforms; and (3) the significant difference between training and combat execution of CAS.

Chapter 4 will begin by defining and examining the context of the problem in terms of the physical and material conditions, which define it, the attributes of the community, and the rules-in-use.<sup>1</sup> Further discussion of the actors involved, as well as the action situations in which they find themselves, will define the environment in which

they interact: the action arena. Finally, this study will examine the three specific subsets mentioned above in the context of the patterns of actors' interaction with environmental variables. The identification of perverse incentives related to standardized execution of doctrine will assist in this portion of the discussion, and lay a foundation for mitigating potential future execution failures.

Examination of TTP, technology, and tasking vehicles (e.g., the ATO, Joint Tactical Airstrike Requests, etc.) will lead to an understanding of how to optimize JCAS Command and Control, execution, and organization in the context of the institution at large. Current CAS application, while currently effective insofar as it delivers effective destructive power against the enemy, does require a procedural, technological, and doctrinal update to be effective and relevant on the battlefield of the future. The very nature of warfare dictates that static, inflexible skill sets will ultimately be overcome by the innovation and flexibility of an adversary, and this study will attempt to show through qualitative comparison why the U.S. military has excelled in adapting JCAS doctrine to meet the threats of the last decade of warfare, and how those lessons can be applied to the future of CAS planning and execution.

Other issues germane to the discussion are the role of technological systems designed for CAS employment, and how precision weapons changed the battlefield dynamic during OIF and OEF. To assert that there is no further room for innovation where CAS is concerned betrays a disconcerting level of hubris, and presents danger for future operations. The battlefield of the future may very well be one in which the lessons learned in OIF and OEF are marginalized, requiring new ways of thinking about new problems. This thesis will attempt to identify ways to think progressively about how CAS

fits in the context of future conflicts, and make recommendations, which will ensure standardized, effective application while keeping in mind the variables of the CAS action arena covered in chapter 4.

Additionally, by shedding light on the outcomes within the CAS environment as a result of the interaction between the physical world, the rules, and the actors involved, this study will attempt to provide institutional-level recommendations aimed at accounting for aberrant results from otherwise sound planning and execution. Even though this thesis will only make limited recommendations to doctrine, the institutional analysis should provide some additional benefit to future studies by offering a way ahead.

### Summary

This chapter outlined the context through which this thesis will approach the study of CAS. The twofold methodology will qualitatively examine the foundations of CAS as a mission and skill set. It will then more deeply examine the institutional underpinnings by applying the IAD framework to analyze actors, the environment, the rules, and the expected outcomes. Chapter 4 will apply this methodology to the three distinct subsets of the CAS mission already mentioned, and provide meaningful context on existing doctrine and practice in order to achieve a foundation for conclusions and recommendations in chapter 5.

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<sup>1</sup>Clark C. Gibson, Krister Andersson, Elinor Ostrom, and Sujai Shivakumar. *The Samaritan's Dilemma: The Political Economy of Development Aid* (New York, NY: Oxford University Press, 2005), 25-27.

## CHAPTER 4

### ANALYSIS

#### Introduction

The previous chapter outlined a methodology for this analysis based on the examination of CAS as an institution. This chapter will apply some qualitative analysis of existing doctrine as well as the IAD framework described in chapter 3 to explain how CAS functions on and off the battlefield, and set the stage for conclusions and recommendations in the final chapter. Following this analysis, chapter 5 will provide conclusions and make recommendations for the future of the CAS institution and for future study of this topic.

As mentioned in chapter 3, analysis of the CAS institution using this institutional approach will examine three distinct subsets of the CAS environment within the bounds of this framework in order to arrive at a point where meaningful, lasting recommendations are forthcoming. Those three subsets are: (1) the rules and laws (ROE) governing the CAS environment during armed conflict; (2) the lack of interoperability arising from the multiplicity of service-specific platforms; and (3) the significant difference between training and combat execution of CAS.

#### CAS as an Institution

In order to begin to examine the CAS environment from an institutional perspective, a few terms, and concepts must be defined so that an appropriate foundation is laid for further discussion. A key to understanding incentives is to examine collective-action situations where the function under analysis is performed. In this study, these

functions comprise the CAS mission. A collective-action situation is simply one in which multiple actors interact within an environment and produce an outcome. Ostrom further provides that an action situation as a conceptual frame allows analysts to compartmentalize a particular set of circumstances related to a broader process in order to make relevant assumptions about interactions and outcomes in order to provide recommendations for reform.<sup>1</sup> CAS is a good example of a collective-action environment in which multiple actors must synergize their efforts toward the goal of delivering fires against the enemy in support of troops on the ground.

Perverse incentives in situations involving policy processes may come from the inability of the actors to influence the incentives. In a combat environment, incentives related to CAS are either successful or unsuccessful support of the ground troops. Whereas this is a clear oversimplification of the available incentives, it illustrates the point that in military tactical execution, there is either success or failure in a broad sense. Even achieving a neutral middle ground implies failure at some level.

The following are key foundational concepts to consider in order to prove that CAS policy (i.e., TTP and execution itself) processes, executed flawlessly, can produce their own perverse incentives: (1) every CAS scenario is a collective-action problem; (2) CAS practitioners genuinely intend to execute JCAS doctrine appropriately (i.e., there is no predisposition for rule-breaking); and (3) webs of relationships, such as cultural relationships, inter-organizational relationships, or rank bias in a military organization, can generate perverse incentives.

A key question to keep in mind as this discussion takes place is: How do incentives at the policy level obstruct institutional reform needed to improve the process?



The basis for this question, and why it is important in this context, is in the three levels of analysis provided by the IAD framework: operational, policy-making, and constitutional. Very briefly, the operational level of analysis describes how actors interact in iterative situations where there is a direct physical outcome. The policy-making level of analysis addresses rules that affect operational processes, and which are deliberately designed and agreed-upon. Constitutional rules define who will make policy using which rules and procedures, and who is eligible to participate in that process.<sup>2</sup>

In the context of the CAS environment, these three levels of analysis can be attributed to CAS aircraft, JTACs, and all the associated tactical functions involved in combat (operational); the symposiums and centers of excellence responsible for writing, reviewing, revising, and promulgating doctrine (policy-making); and higher-echelon guidance defining the executive agent, its responsibilities, and the overarching goal of standardizing CAS in the first place (constitutional).

Nested within these three veins of analysis is a practical framework for conducting the analysis. This analysis will first begin by defining and examining the context of the problem in terms of the physical and material conditions, which define it, the attributes of the community, and the rules-in-use.<sup>3</sup> In the case of the CAS environment, we must define where and when CAS takes place—both in combat and in training—and define what attributes characterize that environment and the dynamics within it. Finally, we must list and define the rules-in-use to complete the contextual description of the CAS environment.

The rules that coordinate interaction structure the incentives imparted on the actors involved. Incentives include two components: an external stimulus and an internal

motivation. In institutional analysis, it refers to rewards and punishments that individuals perceive to be related to their actions and those of others. The key aspect of all institutions is their shared rules regarding what actions individuals must take, must not take, or are permitted to take in particular settings. There is an important distinction between the rules-in-use (i.e., TTP); that is, the rules as they are understood, generally followed, and enforced; and formal, written rules (i.e., doctrine). Likewise, there is a difference between rules and norms; rules are generally enforced; norms are usually not, at least not in a regular way by designated agents.

Collective-action problems occur when actors in a situation choose actions that produce outcomes that are less desirable than others available to them. This problem is particularly applicable to tactical situations where multiple friendly actors attempt to influence the situation, but the enemy also gets a vote in the progression of events. The dynamics of war might dictate that operators abandon an optimal course of action in favor of a suboptimal one designed to respond to unexpected changes on the battlefield. Could this collective-action problem benefit from a formalized accountability process wherein voluntary deviations from choices that lead to optimal outcomes are penalized? Whereas this may appear, on its face, to be a legitimate question designed to improve an imperfect process, in the context of a tactical mission, it is misplaced.

Despite the IAD framework, it is difficult to enforce a mechanism for accountability as it pertains only to CAS execution. Often, the consequences of failing to adhere to TTP or doctrine manifest themselves in far more undesirable ways. Conversely, much like poor driving within the established framework of driving regulations is not in itself an illicit act, the potential consequences surrounding that suboptimal action can

certainly be. Actions available to JTACs and Forward Air Controllers (Airborne) in this sense—where only CAS is concerned—are to send the aircraft home or simply bar it from participation in the CAS event. At the institutional level more options are available, to include disciplinary action, censure, grounding, and removal of qualifications.

There are many other processes within the military for dealing with the consequences of poor execution, which lead to civilian casualties, violations of ROE or the Law of Armed Conflict, or simply poor airmanship. The CAS institution in itself—and by extension those actors responsible for its execution—does not possess a mechanism for addressing the suboptimal results associated with failures in execution. One might ask if it is also necessary to have a separate policing and accountability mechanism for CAS execution, but since the institutions, which make up the actor base for CAS are individually managed via their own processes, de facto policing functions for CAS exist by virtue of this arrangement.

What motivates actors and their decision-making is a key underpinning to examining the whole of the CAS institution. Actors—in this case, operational military personnel—make decisions based on their knowledge of the underlying doctrine and an understanding of the dynamics of the actual tactical situation. Whereas the actor's choice of strategy in a given situation depends on how he or she perceives and weighs the benefits and costs of various strategies and their likely outcomes, military professionals do not have the decision-making leeway in a time-sensitive and life-critical situation to weigh all their options. The rational choice model, involving the assumptions that actors have complete and well-ordered preferences, complete information, unlimited computational capability, and the ability to maximize the net return of their choices, is

applicable, but only insofar as it affects tactical decision-making within the limits of the accepted doctrine or applicable TTP.

Not all individuals in an interaction have access to the same information. Multiple CAS aircraft could all have different interpretations of the ground situation, even given the same information from the same controller on the same radio frequency. This disparate interpretation can also occur between aircrew in a multi-place aircraft. Additionally, it can occur within reporting agencies charged with filtering and disseminating the information (e.g., the Control and Reporting Center); the Tactical Air Control Party itself; or higher echelon commanders directing the battlespace from half a world away.

### Applying the IAD Framework to CAS

The three sections that follow—ROE and the Close-In Fight, The Problem of Interoperability, and Training vs. Combat—will examine instances where the collective-action problem of CAS produces perverse incentives. In order to address the root issues, this study will make some broad assumptions regarding the environment in order to set baseline conditions for the analysis. Let us assume that the doctrine and TTP involved in CAS execution per JP 3-09.3 will not change throughout each comparison, even though changes to the publication realistically occur at a rate, which may overlap an ongoing operation. Let us also assume that these scenarios employ service-neutral actors as the CAS operators. This means that we will not identify the actors by their service branch. It is also important to reiterate that CAS practitioners genuinely desire to conduct CAS per applicable doctrine, and do not deliberately set out to deviate from the rules. These baseline assumptions will enable a strict analysis of the environment and its determining

factors without the cultural or execution bias anecdotally attributed to individual American services. It will also avoid an unintended comparison of services' technology and capabilities, which will only bias this analysis and avoid the deeper institutional issue altogether.

As previously discussed, in order to apply the IAD framework to this discussion, we must define the context of the problem, the action arena, and patterns of interaction, which lead to outcomes.<sup>4</sup> The previous paragraph set forth some assumptions to make characterizing the CAS environment somewhat easier, but in the interest of completeness, we must go further. The attributes of the generic operating environment for CAS are friendly ground forces engaged in armed conflict with another armed force, group, or syndicate. Those friendly forces will have aircraft available to deliver weapons against hostile forces if required. ROE are in place to govern the conduct of combat operations, and to guard against the indiscriminate use of force. To simplify defining the physical environment of CAS, let us focus only on the current prevailing combat situation: Afghanistan.

Aside from the physical and material components, which define the Afghanistan theater of operations, and something which the body of literature does not address, we must also consider the temporal element of the Area of Operations (AO). As with any organization, whether military or in the private sector, time leads to understanding, which defines the organization's learning curve. The sheer amount of time spent in Afghanistan imparts a unique quality on the CAS institution in that it addressed many of the recommendations suggested by the existing body of work.

### About the Actors

According to Ostrom, identifying actors within an action situation is just as important as defining the action situation itself.<sup>5</sup> Whereas the action situation is the stage upon which an analyst describes and from which draws inferences about behaviors in a particular institution, the qualities of the actors are the substance forming the foundation of those inferences. Ostrom further defines four variables used to make plausible assumptions about the actors in a given action situation: (1) the resources that an actor brings to a situation; (2) the valuation actors assign to states of the world and to actions; (3) the way actors acquire, process, retain, and use knowledge contingencies and information; and (4) the processes actors use for selection of particular courses of action.<sup>6</sup>

Based on these four criteria, we can now make educated assumptions about actors within the CAS arena. To be clear, these assumptions are not based on static attributes of the actors themselves, but indicate a significant variation within the subject pool, meaning that no two actors will be the same. How these four criteria are defined within the CAS context will shape expectations of the reader when considering the analysis of CAS as an institution.

The set of available resources that a CAS practitioner brings to a situation is more than simply a function of which mix of weapons, aircraft, and technological systems he possesses. Indeed, there are also a wide variety of intangible factors. The quality of an actor's resources—or the degree to which they are useful in combat—could be directly tied to the experience level of the operator, the number of times that operator has conducted operations within that AO, the number of times actually employing weapons in support of troops, from that the number of historical mistakes made, and any biases about the

situation based on previous experiences or training, or even personal views about the conflict.

The valuation actors assign to states of the world and to actions is directly related to the perspective of the actor within a situation. This study takes into account that not all situations regarding CAS are in actual combat by comparing the disparities in those separate environments (i.e., training). The goal is to isolate outcomes within the combat arena based on the predilections of actors involved in those situations. In relation to the first criterion listed above, the experience level, which defines the resources an actor brings, may also drive the degree to which they apply focus and tenacity to given combat situation, thus affecting the potential outcomes. The biases of the training environment in a following section should shed more light on this particular aspect.

The way actors obtain, process, and utilize the knowledge and information they have within a situation is directly related to how they decide upon actions that lead to favorable outcomes. Alternatively, in the event that a situation degrades to a point where practitioners are forced to rely on creative solutions based on experience or familiarity with procedures and doctrine, they may be forced to take actions meant to mitigate harm or other suboptimal effects.

Finally, the processes actors use for selection of particular courses of action, building upon the previous criterion, should ideally be based upon solid understanding of the doctrine, augmented by effective training, and tempered in applicable cases by the informed judgment of the practitioner. Moreover, selection of particular courses of action should be congruent with the intent of the rules in use, and not because of a perverse incentive stemming from a particular action situation. These four criteria now form the

basis for the attributes of actors in CAS action situations. In combat or training, these attributes and biases will not change within the bounds of this thesis.

### Defining the CAS Action Situation

Thus far, this study has only hinted at the existence of the CAS action situation, and that its function is to help contextualize the outcomes derived from the interaction of actors, rules, and the environment. As with the criteria defining the actors in a given action situation, Ostrom provides another useful set of factors to define an action situation in more specific terms. Those factors are: (1) the set of actors; (2) the positions, which those actors can occupy; (3) the set of allowable actions; (4) the potential outcomes; (5) the level of control over choice; (6) the information available; and (7) the costs and benefits of actions and outcomes.<sup>7</sup>

The set of actors in a CAS action situation necessarily include combat units, both in the air and on the ground, controllers (JTACs), the host of Command and Control entities (though less relevant within the bounds of individual tactical engagements), noncombatants, and of course the enemy. In the interest of being complete, the set of involved actors with respect to CAS is much more extensive when one considers all the potential interactions a practitioner has with various entities and institutions involved with the CAS mission, however slight. In order to constrain this study to relevant facts to produce specific, meaningful conclusions, the set of actors will be restricted to only those specifically involved in CAS execution in training scenarios and in combat.

Positions within this action situation are specific to each type of actor. JTACs perform essential target nomination and terminal control functions, effectively initiating and consummating each attack. Combat units apply lethal and non-lethal effects toward



the accomplishment of the controller's mission. In the case of airborne assets, they can also function as reconnaissance platforms, feeding up-to-date information to controllers and other ground combat units in order to build a better common operating picture. In some cases, airborne assets can also function as controllers if properly qualified as a Forward Air Controller (Airborne). JCAS doctrine clearly defines the responsibilities of each of these positions, and how their interaction leads to mission accomplishment through the application of standardized procedures.

Doctrine is the first baseline for defining the set of allowable actions within the CAS action situation. It establishes the set of rules applicable to every CAS practitioner, exclusive of ROE, which restricts actions available to combat units. Some examples of allowable actions include the use of lethal force under appropriate circumstances, performing non-lethal actions where the ROE do not allow a lethal action, and the host of administrative and foundational actions leading up to the actual attack (e.g., the 9-line brief, target identification, situation report, etc.).

CAS is a very dynamic mission with many variables that can affect successful execution. Ideal outcomes, all things being equal, are a function of proper execution of JCAS procedures per JP 3-09.3, appropriate levels of training on the part of the practitioners, and predictable actions by the enemy. In reality, however, potential outcomes are the result of conditions on the battlefield, actions of the enemy (expected or unexpected), performance of attacking assets, and the proficiency of the controller in identifying targets and conducting the attack. In light of these factors, potential outcomes fall into four general categories: (1) successful attack against the intended target with no collateral concerns; (2) unsuccessful attack against the intended target with no collateral

concerns; (3) any attack, which affects collateral concerns, including Civilian Casualties (CIVCAS), border incursions; or (4) enemy action resulting in friendly degradation or loss.

The level of control over choice in CAS missions—specifically in combat where the enemy can influence the outcome—is a function of the set of allowable actions and anything, which might influence the potential outcomes. Controllers at all levels exercise tactical judgment in choosing whether to nominate a target. They also choose the parameters of the attack, and ultimately approve the attack when aircraft are in a position to deliver lethal effects. The enemy also has a stake in how much control friendly assets can exert over their environment. Enemy actions may influence controllers or aircraft to take suboptimal actions compared to what they intend in order to dynamically respond to changing threats. These actions can certainly influence future actions based on their outcomes, desired or otherwise.

Information available in the CAS action situation may come from a variety of sources, and may be timely or not. The actors must have the knowledge and experience to categorize applicable information and act upon it in such a way as to work toward a desired outcome. Additionally, the information available about the AO, including the enemy, terrain, weather, and noncombatant population all form the basis for tactical understanding and how best to apply CAS skills in support of the mission.

Finally, costs and benefits of actions and outcomes are really a function of foundational training and knowledge of the doctrine. This knowledge base is further augmented by studying lessons learned from previous actions, as well as knowledge of incidents resulting in unfavorable or catastrophic consequences, such as training

accidents and instances of CIVCAS or target misidentification. This final aspect of the action situation is also related to the attributes of the actors defined earlier. In the case of CAS, experience and a solid doctrinal foundation on the part of the practitioners nominally correlates to favorable outcomes. Conversely, poor knowledge and unfamiliarity with doctrine (i.e., rules) lead to unfavorable outcomes, all things being equal.

### ROE and the Close-In Fight

ROE have evolved in the current theater of operations over more than a decade of armed conflict in Iraq and Afghanistan. By necessity, the ROE focus on the goals of friendly forces while maintaining compliance with the Law of Armed Conflict and other applicable international laws. ROE generally come in two varieties: offensive and defensive. Offensive ROE defines the conditions, which must be met in order to employ purely offensive measures toward a declared hostile entity. Defensive ROE generally deal with situations of self-defense, or self-defense on behalf of a third party.

ROE evolves and grows as a conflict ensues, shifting its shape to best meet the needs of the force while providing at least the required minimum layer of protection to noncombatants. An unintended consequence of ROE, however, is that it is often used as an unconventional weapon by the adversary to provide them safe haven while they remain engaged with friendly forces. In practical and modern terms, the enemy has learned to unscrupulously operate within and among the noncombatant population, enabling them to conduct offensive operations while effectively remaining shielded behind the very ROE that prohibit deliberate action, which could potentially result in CIVCAS.

The employment of aircraft in CAS situations assumes certain variables: (1) that the aircrew has a baseline understanding of doctrine and are proficient; (2) that the ground unit reacts in sufficient time, including effective liaison with the aircraft, to produce a desired outcome; and (3) the target is verified as legitimate. However, even stipulating to the professionalism, proficiency, and accuracy of CAS aircraft, is CAS being used as a substitute by ground forces for maneuver simply because it is readily available and avoids placing ground troops into dangerous situations?

Air power, and more specifically CAS, is ubiquitous in modern conflict, and appears to be an effective opiate for risk-averse commanders in these sorts of counterinsurgency environments. As a result, however, ground units have taken a proverbial back seat in force projection based on this reliance on air power over maneuver. Modern attack and reconnaissance aircraft have evolved technologically to a point where they can provide real-time, detailed imagery of a target area and, if required, deliver weapons to a precise location based upon the fidelity of what they obtain. With this amount of superior air power available, however, commanders appear less inclined to place the lives of ground troops in jeopardy, instead opting for air power to conduct offensive operations in situations where maneuvering troops to contact would expose them to a potentially omnidirectional, nebulous threat.

The problem in such a complex environment, lacking the clarity of force-on-force dispositions, is that not every tactical situation is appropriate for attack aircraft or the suite of weapons they carry. The enemy conducting an insurgency knows this, and tailors his own movements and operations to take advantage of this fact. Because modern air power enables commanders to make a less risky decision on ground troop commitments,

by extension the ROE have become more and more restrictive where CAS is concerned due to failures and miscues committed by well-meaning aircraft.

Coupled with this apparent mismatch of offensive capabilities and enemy courses of action is believed that America failed to apply the lessons of counterinsurgency it learned from years of protracted conflict in Viet Nam. Since modern American involvement began in the Middle East theater of operations in general in the early 1990s, the preponderance of military action was conducted by and based upon technologically advanced systems to aid the force-on-force paradigm of warfighting. In the two decades and more that have followed since the Gulf War, military force is still employed in much the same way: large combat units with advanced technology and on-call air support mere minutes away.<sup>8</sup>

As more than a decade of war has shown, since the first operations began in Afghanistan in 2001, the types of maneuver forces, which are most effective against threats able to blend into their native populations, are special operations forces. Though this is a generalization to a certain degree, Cassidy holds that even though the tactical and operational landscape of Afghanistan warranted smaller, more agile maneuver forces, the Army as an institution was still focused on large-size combat echelons and their associated movement, maneuver, and tactics.<sup>9</sup> The Army, leveraging concepts which had worked in the conflicts of the past, may have initially been unable to embrace the notion of regular tactical units on a small enough scale to fight and win the war in Afghanistan against groups of super-empowered native fighters able to blend into the noncombatant population.

Though the U.S. did indeed employ a small force in Afghanistan, regular forces retained their force-on-force mentality rather than integrating more effective counterinsurgency tactics like their special operations forces counterparts, virtually necessitating an overreliance on air power.<sup>10</sup> With the availability of massive amounts of air power on call on any given day, ground commanders fell away from the need to commit regular troops to potentially unfavorable tactical situations where the enemy disposition was unknown, and instead opted for air power. Ground troops effectively began to let this entitlement to air power take the place of maneuvering under fire or against an emplaced adversary.

Thus, the way that the ROE evolved was tied to this interaction with a small regular force exercising unfamiliar counterinsurgency doctrine with a heavy emphasis on air power. In the early years of Afghanistan, this method worked by accident, as a large force conducting traditional warfare was not necessarily required against the Taliban. Air power was very effective at defeating them, but when the enemy began to operate among the population, and became more difficult to identify, what had worked in overthrowing the Taliban led to unacceptable casualties.<sup>11</sup>

This study considers the advantages of insurgency, or of unconventional warfare where the enemy strikes from the shadows, uses culture and custom to his advantage, and blends in with the population. This enemy is difficult to identify, and more difficult to prosecute with offensive operations. This enemy operates within population centers, and among noncombatants, often using violence or the threat of violence to ensure continued shielding by the population. Given the suite of weapons in use by the military—by both

ground-based platforms as well as aircraft targeting these individuals or small groups implies a certain level of collateral damage if left unmitigated.

The ROE prohibit any indiscriminate use of force, which may result in CIVCAS. It also strictly prohibits the employment of fires in population centers where CIVCAS would be assured. Simply put the best and most flexible assets available to ground units—aircraft—are essentially useless as offensive platforms when the enemy shields himself with noncombatants. The question then becomes: How can CAS be effective in such a fight even though it accounts for the preponderance of kinetic actions?

That question is at the crux of the ROE argument, and further asks whether ground forces have allowed their proficiency in basic movement and maneuver tactics to atrophy in favor of an easier solution, thereby influencing future ROE development.

### The Problem of Interoperability

This study will make use of two definitions for interoperability. The first deals with how individual service components interact in the JCAS arena based on doctrine and standardized procedures. The second addresses the degree to which pieces of technology work with each other, and are able to share useful data across multiple platforms and services.

Many of the studies from the last decade infer that the majority of the CAS execution problems suffered by the joint force are due to individual services' so-called parochial interpretation of CAS TTP. A more realistic conclusion is that because dynamic combat situations were vastly different from any of the myriad training scenarios suggested, the basic human default was to revert to plain-language communications, the "tactic of the moment," and actions centered on a single unit rather than the battlefield at

large. In simpler terms, CAS execution completely broke down, and the regimented procedures designed to avoid confusion and synthesize action on the battlefield were summarily disregarded.

### Joint Command and Control

In modern combat operations, most specifically OIF and OEF, commanders at many different echelons must control a wide variety of aircraft across the breadth of the coalition. These aircraft perform missions such as aerial refueling, transport, reconnaissance, and strike, and their seamless integration is critical to the success of day-to-day operations. In order for Command and Control to be effective for such a wide variety of aircraft flying literally tens of thousands of linear miles each day, an appropriate means of coordination must exist which is widely distributed, easily accessible, and not difficult to interpret. The ATO accomplishes this feat by effectively acting as the daily flight schedule for the entire balance of air power for major combat operations. The ATO is the end product of a very precise battle rhythm which takes apportioned assets, allocates them to supported units, and then coordinates their movement and required support across an entire theater of operations. Although that is a very simple explanation, the process is indeed quite involved.

At the center of the ATO-generation process is the Air Operations Center (AOC). The Air Operations Center can be further categorized as a joint air operations center for U.S.-only multiservice campaigns, or a combined air operations center when a multinational coalition is involved. The combined/joint air operations center is responsible for planning, directing, and executing joint air operations in support of the



joint force commander's operation or campaign objectives.<sup>12</sup> Hereafter, this thesis will solely reference joint air operations center as the principal Air Operations Center agency.

A variety of mission-specific cells within the Air Operations Center govern the collection of tailored information and feed tactical and support requests into the ATO-generation cycle, simply called the ATO cycle. Those cells are the Combat Plans Division, Combat Operations Division, Air Mobility Division, Strategy Division, and Intelligence, Surveillance, Reconnaissance Division. The ATO cycle is a predetermined amount of time for all preplanned requests to come from the requesting agency and be included on the published ATO. Requests that do not meet the time requirement, or ATO cut-off time, are submitted as changes to the published ATO through the combat operations division or as immediate requests through the appropriate chain of command.<sup>13</sup>

There are two types of CAS missions: preplanned and immediate. Preplanned CAS can be further subdivided into scheduled and on-call missions, though many immediate requests are filled by either diverting scheduled sorties or sending on-call assets.<sup>14</sup> ATO tasking follows these types of CAS, although in preplanned, scheduled CAS a great deal of planning occurs before that sortie is published on the ATO. As OIF drew to a close, and as OEF is doing so now, the preponderance of the CAS sorties are on-call CAS sorties. Supported units request CAS assets for the often-nebulous task of armed overwatch; just to have air support available in case their routine operations come under fire. The benefit of having multiple sorties of on-call CAS sorties in the AO at once, however, is that there is a better chance that immediate CAS requests can generally be serviced in much less time.

It is important to note, however, that commanders cannot simply request unlimited on-call CAS sorties for the possibility that something might happen somewhere sometime. The ATO is designed to publish preplanned, detailed tasking, and afford for ground maneuver units to request other forms of air support when commanders deem it appropriate. The resulting ATO in this case includes a mix of preplanned CAS with a specific target, time-on-target, weapon, and effect assigned, and appropriately sourced on-call CAS sorties to provide support for units engaged in tasks requiring the presence of airborne assets, but whose absence does not necessarily mean mission failure for that supported ground unit.

In the case of Army maneuver units, Close Combat Attack has an advantage over ATO-assigned CAS. The Army's air power assets are uniquely suited to providing on-call, immediate support to ground forces. All active combat divisions have a Combat Aviation Brigade, which can operate in an Operational Control or Tactical Control command relationship.<sup>15</sup> Because the Combat Aviation Brigade is a subordinate unit to the larger combat maneuver force, it is more intimately involved in planning, and thus has the advantage of participating in face-to-face coordination with the supported unit.

This subordinate relationship enables ground commanders to further shorten the kill chain by having mission-ready support assets immediately available as part of the command relationship. Fixed-wing CAS assets, while flexible and effective are still restricted by time, fuel, and distance constraints in support of immediate requests for CAS. This inherent delay favors the organic firepower provided by the Combat Aviation Brigade to Army maneuver units unless the fixed-wing assets on request happen to be directly overhead or a short distance away.

By its nature, the ATO provides clear, daily assignments, however the nature of airpower implies a certain level of on-call flexibility. In a world of unlimited resources, every Joint Tactical Airstrike Request submitted by every unit in an AO would have a dedicated mission on the ATO, and the need for organic assets within the maneuver unit would cease. This world would have an unlimited amount of refueling support, weapon availability, aircrew availability, and airfield facilities to host and maintain aircraft. With no limit to the amount of aircraft allocated to schedule CAS, there would never be a need to request immediate CAS, and indeed many of the Command and Control processes involved in allocating resources to meet emergent needs would no longer be required.

Reality, however, is different. The real-world limitations on combat assets, the support required to arm and maintain those assets, and the people required to operate them dictate that air support cannot be everywhere all at once. As previously discussed, the ATO allocates and assigns assets to supported units whose requests have met the approval criteria of cognizant authority. Not every request is approved, and even approved requests may not involve a great deal of actual activity on the part of the supporting element. Moreover, in OIF and OEF it was not uncommon for aircraft filling a specific ATO mission to be diverted (also called “re-roled” in practice) to support a troops-in-contact scenario, or to fill another mission where the assigned assets became unavailable. From JP 3-09.3:

JTACs and aircrews must carefully weigh the choice of munitions and types of TAC [terminal attack control] against the risk of fratricide, (e.g., troops in contact does not necessarily dictate a specific type of control). “Troops in contact” is an advisory call to increase awareness and to highlight the urgency of the ground situation. Troops in contact require the supported commander to determine priority of CAS with respect to other mission impacts.<sup>16</sup>

Troops-in-contact scenarios require enhanced vigilance on the part of supporting units. JCAS history is replete with examples of how hurried operations—especially under the guise of troops-in-contact—leads to fratricide.

In order to bridge the capabilities gap between scheduled ATO CAS tasking, whether preplanned or on-call, robust Command and Control functions must play a role in terms of real-time coordination of CAS assets and effective, accurate transmission of updated mission orders. The Control and Reporting Center, which exercises positive control of aircraft in an AO, has the communications infrastructure to provide this function. Aircraft servicing specific on-call CAS sorties line tasks on the ATO may or may not be re-rolled to alternate missions, but the communications infrastructure exists to retask aircraft in near-real-time if required. This ability provides flexibility to ground force commanders to operate inside the ATO cycle and rapidly adapt friendly force dispositions to emerging needs.

### The Conundrum of Precision Weapons

Though the advent of precision weapons brought increased lethality and a higher level of battlefield control to kinetic strikes, these weapons brought with them a host of concerns whose effects extend into the CAS realm. Even though confidence in their accuracy is very high, the magnitude of errors is also of major concern. Specialized procedures and systems govern the release of precision weapons, and while those procedures are designed as a mitigating function, human error still results in potentially catastrophic consequences. Several cases of fratricide in the last decade owe their tragic end result to human error, either on the part of the terminal controller or the aircrew themselves.

Modern precision weapons generally fall into two broad categories: LASER-guided weapons and Global Positioning System-guided weapons, hereafter referred to as Inertially Aided Munitions (IAM). For the purpose of this analysis, all references to IAM will specifically deal with the Joint Direct Attack Munition, a specific type of unitary, high-explosive weapon guided by Global Positioning System.

LASER-guided weapons generally operate by guiding toward reflected LASER energy emitted at a predetermined pulse repetition frequency, which is termed “properly coded” LASER energy. Either terminal controllers or aircraft—even the attacking aircraft—are able to provide this through handheld systems, in the case of ground forces, or onboard targeting sensors. Simply put, once the bomb is released from the aircraft, it does not discriminate between intentional and unintentional LASER energy. It simply tracks whatever properly coded energy it can detect. A number of environmental factors can affect how the weapon’s seeker tracks LASER energy, but in simplest terms, if the bomb sees it, the bomb tracks it.

The obvious problem, therefore, with LASER-guided weapons is the human element involved in providing the LASER energy—the target “designation”—as well as the procedures in place to ensure the attacking aircraft is engaging the target from the appropriate position. If the aircraft is in the optimum attack position, the weapon acquires the LASER energy reflected from the intended target and guides to impact. If, however, the aircraft is in the wrong attack position, and terminal controller is unaware of this fact, the weapon could track the LASER energy from the source of emission—the friendly position—and result in severe injury or death to friendly forces.

IAM have a similar human-error conundrum, and it specifically deals with how the bomb itself receives target data. In most instances of IAM employment, much care goes into target selection, coordinate generation, and elevation determination. The defining aspect related to the employment of IAM is the degree of accuracy of the target coordinate based on the measurement standard used to derive that physical location on the face of the Earth.

The most common method of employing IAM is for a JTAC to relay a target coordinate in latitude/longitude/elevation format to the attacking aircraft via the 9-line brief (lines 4 and 6). Once the 9-line is received, the aircrew manually enter the elevation and coordinate data into the weapon by means of a digital interface in the aircraft. The aircrew are obligated to then read back that information to the JTAC for verification, and that data comes directly from the targeting data in the weapon. In some instances, aircrew will read the targeting information from what they physically copied onto a piece of paper rather than what the weapon shows. This creates the illusion to the terminal controller on the ground that his message was received and will be executed as he expects. Unfortunately, recent case studies show that transposing one digit in either the coordinate or elevation, reading back the data inaccurately, or improperly executing this very specific procedure, just to name three examples, have all resulted in some sort of tragic event involving IAM, typically loss of life. Here again the human element nullifies the advantage of technology and the regimen of standardized procedures.

Modern targeting sensor technology allows for dynamic coordinate entry into IAM based solely on tracking targets with targeting sensors and not manually entering coordinates. This allows JTACs and aircraft to rapidly engage targets of opportunity

without the static set of procedures normally involved in IAM employment. The method previously discussed of manually entering coordinate and elevation data into the weapon takes time, and is appropriate for static targets unlikely to move. Not all targets remain stationary, such as cars, mobile weapon systems, or even people. This dynamic targeting capability using the targeting sensor allows for rapid transfer of coordinate data to IAM in order to shorten the kill chain. The location data (i.e., coordinates and elevation) of whatever target the aircrew is tracking with the sensor is automatically transferred into the weapon with no manual input required. The success of this style of attack is of course predicated on two factors: (1) the target remains stationary after the weapon leaves the aircraft; and (2) it is the correct target.

Before the advent of LASER-Joint Direct Attack Munition, which enables the same coordinate-dependent weapon to adjust course in flight by tracking LASER energy—once an IAM left the aircraft, its intended point of impact could not be changed. In effect, wherever it was told to go when it left the aircraft was where it was going. Any errors through data input or guidance failures could not be fixed. LASER-Joint Direct Attack Munition, addressed this problem, though the addition of a LASER seeker was not intended as a fail-safe; the improved capabilities of the LASER-Joint Direct Attack Munition, made it useful against non-stationary targets, and addressed any target location errors inherent in the way the target coordinate was derived.

Though LASER-Joint Direct Attack Munition, unintentionally addressed the human error problem inherent in standard IAM, it does not relieve terminal controllers and aircrew from the responsibility to adhere to standard employment procedure. In some ways, LASER-Joint Direct Attack Munition, added several new procedures to further

compound the problem of human error. Indeed, the joint force employs a staggering array of weaponry in the CAS arena, and both terminal controllers and aircrew have an obligation to be familiar with each one, their effects, caveats involved in their employment, and the procedures governing how to employ each one, which are far from uniform.

### Training vs Combat

One major hurdle that aircrew must overcome is the transition from the CAS training environment to the real-world CAS combat environment. In training, CAS aircrew enjoy the benefit of a relatively austere environment devoid of many stresses of the battlefield. Controllers sound calm and collected, the background is not dominated by the din of gunfire and screaming, and in most cases internal to the unit conducting training, and the voices on the radio are all familiar.

Tactical aircrew, JTACs, and all other required supporting units are well aware that executing CAS in combat is much different from executing CAS in the training environment. The paradox lies in the assertion that CAS follows doctrine, so combat execution and training execution should be virtually identical. The U.S. military is fond of the phrase “train like you fight,” meaning that execution in training should mirror the conditions present on the battlefield. From a practical standpoint, this makes perfect sense, as commanders desire the proficiency in combat that repetitive, meaningful training provides. It is ironic that CAS practitioners, and indeed the whole of the joint force, adopt this “train like you fight” mantra, intending the best, but effectively accepting that the training environment will never be an adequate representation of the stress, uncertainty, and dynamic nature of a real battlefield.



The world in which actual, combat CAS is executed is very real, and quite likely could involve people dying. It can be chaotic, noisy, and uncertain. Due to stress on the part of the controller, especially if he is receiving effective fire from the enemy, the austerity of CAS quickly evaporates. The reliance upon JCAS doctrine is the lynchpin between success in combat, and a host of potentially lethal problems resulting from a breakdown of executing common procedures.

JCAS doctrine also serves as the “great equalizer” in terms of experience level. Younger, more inexperienced aircrew rely heavily on the “book answer” regarding CAS execution. More experienced aircrew are accustomed to the general flow of a CAS mission, whether in training or through combat experience, but are at the same time , paradoxically, prone to shortcuts which diverge from the strict line of JCAS doctrine.

Indeed, as expressed in CAS-related works over the last decade, adherence to doctrine is a sure way to maximize chances for success. Conversely, plenty of cases such as the Udairi Range case and the B-52 Joint Direct Atrack Munition, case exist to illustrate how human error, unfamiliarity with systems in a combat environment, and failure to execute basic procedures can lead to catastrophic consequences.<sup>17</sup>

An interesting disparity in CAS execution emerges when examining the mantra “train like you fight,” which is an irony in itself when one considers the relative austerity of the training environment. The goal of CAS training is to use the often-limited resources available to create a microcosm of the battlefield, attempting to provide as realistic a situation as possible for the participants. One example of a typical CAS training event could include one hour on a dedicated air-to-ground training range, such as the Superior Valley range complex near Naval Air Weapons Station China Lake,

California. Additionally, the participants would be a mix of Hornet and Super Hornet aircraft (in the case of a Navy event), with two to four aircraft designated as attacking platforms and one designated as a Forward Air Controller (Airborne). There would typically be no indirect fire assets available, and no Tactical Air Control Party on the ground, nor would there be actual threats in the target area. There are always exceptions to this array of assets, but outside of a deployment work-up cycle, and outside the bounds of a dedicated large-scale exercise, this is the typical makeup of a CAS training event.

The conduct of a CAS training event involves a large amount of role-play on the part of the participants, primarily performed by the Forward Air Controller (Airborne) or Tactical Air Control Party (if available). Moreover, the participants in a local-area event are typically socially familiar with one another; even as part of a large-scale exercise, there is still an underlying psychological affirmation that everyone is just there to train, and in no real or perceived danger. What is ironic is that despite the intent of the training to be as realistic as possible, it seldom represents anything of the sort. In fact, CAS training is more often an iterative exercise in following JCAS procedures than it is a representation of a battlefield. Whereas CAS training is certainly intended to breed familiarity with doctrinal procedures through repetition and evaluation, its role in helping practitioners “train like they fight” is overstated.

The greatest discriminants in combat versus training CAS are most certainly the dynamics of the actual battlefield. Yet another irony is that while CAS is a regimented, doctrinal process, a real-world battlefield seldom follows that regimen. The most important factor for CAS aircrew is the combination of baseline knowledge imparted by a

thorough understanding of JCAS doctrine and the repetitions performed in training, regardless of the realism involved.

From an institutional perspective, the addition of the enemy actors in this context constitute the primary, and most important, difference. By extension, their participation in the new range of action situations available further distinguishes the combat action arena from the training action arena. Despite this obvious difference, the common factor remains the doctrine—indeed the rules—governing both of these environments. What changes with respect to the common set of rules applied equally to both scenarios are the outcomes resulting from choices actors make in each situation.

What drives the differences in available outcomes in the training environment versus the combat environment is the underlying mindset of the actors, and ancillary factors on the periphery of the action situation itself. For example, in the training arena, aircrew are operating during a specific range of time as defined on a squadron flight schedule. The range time is carefully scheduled and synchronized with the flight schedule, as is the availability of the aircrew involved. In the back of every aircrew's mind is, therefore, the need to adhere to this administrative aspect, and they meter their performance accordingly during the training event. Additionally, there are the host of competing requirements occupying the background of the aircrew's mind, such as the non-flying ground job waiting for them once they land, other events on the flight schedule that same day, and even what to cook for dinner that night. Though this example may appear flippant, it is still relevant in distinguishing the difference in outcomes between the two action arenas and what drives them.

Combat, on the other hand, has many other unique environmental variables. The basic context for the combat arena is that it takes place far away from home, and away from the typical distractors as typified in the previous paragraph. The flight schedule is driven by the ATO, and as such injects the aspect of combat realism into this administrative function. The very nature of a combat deployment implies a heightened level of focus on professional tasks and performance. In addition, due to the nature of combat, the focus of every aircrew is on keeping ground troops alive through their timely, accurate support. Simply put, distractions are unwelcome and are therefore pushed aside.

So is the training arena a valuable tool in preparing aircrew for the rigors of the combat environment? In the sense that the “train like you fight” mentality is alive and well, then no. Absent the rigors of the modern battlefield, the training environment will always fall short of adequately emulating combat. The sense of the unknown that pervades combat is simply not there. Indeed, the training environment is in many ways defined by its certainty; perhaps not in the conduct of the training evolution itself, but in the underlying factors that define the context of the training environment.

Instead, let us posit that it is truly the iterative process of reinforcing doctrine through repetition in a variety of tactical simulations that is of the most use. And more importantly, it is the thorough examination—the debrief—of that mission conduct that draws out the major learning points and reinforces both effective and ineffective actions in that same micro-context.

In order for CAS aircrew to enter an action situation like combat with the best defense against uncertainty and enemy actions, it is imperative that they have a solid doctrinal foundation. Regardless of the action of friendly or enemy actors, and the

uncertainty and chance, which define the battlefield, doctrine remains the Rosetta Stone that best synchronizes joint effort against an adversary.

### Evaluating the Institution

The CAS institution, over time, has done an adequate job policing itself and implementing key issues drawn out in lessons learned and after action reports. The fact that the joint force now has a doctrinal publication called *Close Air Support*, and not simply *Joint Tactics, Techniques, and Procedures for Close Air Support* as it was previously titled, symbolically and tangibly shows the progression of this skill set over more than a decade of combat and peacetime operations.

Taken in the macro context, the CAS institution has become smarter with age. The CAS institution with respect to combat is one in which the range of variables is both vast and unpredictable. Time forces the institution to change as it learns and grows within an environment: to wit, the combat theaters of operations for the last 12 years of war in Iraq and Afghanistan. Unlike the training environment, which is scripted, conducted within physical and procedural boundaries, and predicable to a certain degree, the real-world combat environment is one of gaping uncertainty, forced into action based on imperfect or no information, and executed on a basic, common foundation which only sets the baseline for execution exclusive of the judgment and creative thinking required when executing against a flesh-and-blood enemy. Regardless of the actions of the individual actors, the institution as a whole has improved by means of its own internal processes. Past assertions that the joint force could operate more jointly when it comes to CAS are valid in a micro sense when considering cases involving loss of life or other

undesirable consequences, but those instances amounted to a combination of human error and improper execution when compared to the clear doctrine.

In addition, at the micro level, one must consider the individual action arenas. Based on doctrinal training, the conditions, which define tactical CAS action situations, are fairly predictable: friendly troops in contact with enemy troops in close proximity. Air power supports via standardized coordination from the ground, and aircraft employ weapons against the enemy, but this is where the predictability ends. The enemy gets a vote in any real-world combat action situation, and the baseline of doctrinal information must serve as a guide for future actions. In case studies such as the B-52 Joint Direct Attack Munition incident, it is clear that the stress of a combat situation—often called the “fog of war,” a term coined by von Clausewitz—can force nonstandard action which has the unfortunate consequence of fratricide.<sup>18</sup> Likewise, deviating from doctrinal procedures—and even accepted TTP—the incident at Udairi Range in Kuwait shows that the momentary distraction, and indeed complacency, injected into the situation by the F-14 with extraneous communications led to several unnecessary deaths.<sup>19</sup> An analyst must ask the question: Were it not for these tragic incidents would the institution self-correct? Perhaps this aberration in the institution, which a refocusing on baseline procedures and self-policing, only occurs after a major incident.

One danger in the CAS environment at an institutional level is the anomaly stemming from accepted rules at the lowest level, or TTP within TTP within doctrine. The doctrine exists as an accepted, and indeed mandated, baseline for conduct. So, in action arenas at the tactical level, how does the institution address the tendency for actors to agree upon rules within rules, which may lead to their own perverse incentives? In this

situation, willing participants shift from making collective-action decisions defined by clear rules to making new rules that in themselves define and create the conditions for future actions. Whereas this process does occur, and is actually welcomed, within the framework of a rule-making entity such as the annual JCAS Symposium, operators in the field making these same types of decisions assume unnecessary risk.

Given the myriad number and type (not to mention nationality) of aircraft which may be tasked to support a given AO, a shifting in that tactical baseline of rules—while incremental and undetectable over time to the practitioner—can inject great confusion into a situation where the aircraft in support over time can no longer speak the same language as the troops they are tasked to support. This disparity in baseline doctrine stemming from an organization that takes matters of rules into their own hands leads to confusion on the battlefield, and in the case where clearly defined ROE dictate how an engagement may or may not be conducted, extends the kill chain beyond a reasonable point, and forces aircrew to spend an inordinate amount of time translating the intent of the ground force and making it applicable to ROE under which he is forced to operate.

A problem with evaluating the CAS institution is in the criteria. The preponderance of commanders would likely agree that successful CAS occurs when 100 percent of engagements are successful with zero percent loss of friendly life, regardless of if they are conducted in training or in combat. This binary mentality is ubiquitous in the U.S. military and further compounds the conundrum of evaluating the institution as a whole. Rather than focusing on extremes, however, let us instead focus on some basic goals of the CAS institution: (1) doctrine is the baseline; deviations should fall within the judgment of the practitioner within the bounds prescribed by JP 3-09.3; (2) evaluation of

current processes should be performed on a regular basis by a constituent body of competent practitioners and cognizant commanders; (3) CAS is a useful tool in combat, but not a universal one. Rather than focus on all-or-nothing measures of effectiveness, the CAS institution should focus on more practical criteria which define and indicate the overall health of the institution, not whether or not it carries a perfect track record.

### Comparing Other Institutions

The U.S. Navy's flight safety and procedures program, the Naval Air Training and Operating Procedures Standardization (NATOPS) program, prescribes general flight and operating instructions and procedures applicable to the operation of all U.S. Naval aircraft and related activities. The program issues policy and procedural guidance of the Chief of Naval Operations that is applicable to all Navy and Marine Corps aviation personnel. Each NATOPS manual has the following quote:

NATOPS is a positive approach toward improving combat readiness and achieving a substantial reduction in the aircraft accident rate. Standardization, based on professional knowledge and experience, provides the basis for development of an efficient and sound operational procedure. The standardization program is not planned to stifle individual initiative, but rather to aid the commanding officer in increasing the unit's combat potential without reducing command prestige or responsibility.<sup>20</sup>

Additionally, every NATOPS manual contains the following quote to underscore the need for sound individual thinking, and not blind compliance regardless of the circumstances:

This manual contains information on all aircraft systems, performance data, and operating procedures required for safe and effective operations, however, it is not a substitute for sound judgment. Compound emergencies, available facilities, adverse weather or terrain, or consideration affecting the lives and property of others may require modification of the procedures contained herein. Read this manual from cover to cover. It is the air crewman's responsibility to have a complete knowledge of its contents.<sup>21</sup>



One guiding principle of NATOPS, and indeed of the military in general, is that high-level guidance is not the end in itself. Institutions are obligated to put forth the best guidance they can muster, and leave unforeseen circumstances to the competent individual, subject to his experience and judgment. Commanders, in some circumstances, are authorized to modify procedures according to their judgment, but must never be less restrictive than the baseline guidance. In simple terms, they can be more strict if desired, but must always maintain the baseline standard.

This program also takes inputs from all members of the community toward constant improvement of the program. These change recommendations are reviewed periodically and approved changes are incorporated into follow-on versions of all NATOPS publications. This enables the community to have a stake in the health of its safety and procedures program, and encourages participation by all its constituents in order to keep the doctrine current and relevant.

Where CAS is different is that with the myriad of potential actors, that baseline must remain intact to the maximum extent possible. Within individual units, practitioners may train to a specific way of reading back a portion of the 9-line, such as injecting a momentary pause between the easting and northing of a grid coordinate, but the net effect of that micro-level decision is ultimately nil. Given an intense combat situation where friendly troops can no longer categorize their situation in terms of a neat, precise doctrine, they may be forced to use procedures that simply get the job done under the best conditions they can achieve within boundaries set by their judgment.

Gibson, Andersson, Ostrom, and Shivakumar define rules as “shared understandings among those involved that refer to enforced prescriptions about what

actions (or states of the world) are required, prohibited, or permitted.”<sup>22</sup> Where CAS is concerned, the rules and the rules-in-use may differ based upon the extent to which combat stress affects application of strict CAS doctrine. Practitioners need to have a certain degree of muscle-memory regarding their baseline procedures so that when circumstances force them to deviate (intelligently, hopefully) from doctrine, they automatically base their creative decisions on doctrinal fundamentals.

### Summary

This chapter applied qualitative analyses of existing CAS doctrine as well as institutional analyses via the IAD framework to describe the CAS environment and expected outcomes. Using three distinct environmental subsets involving CAS, this chapter examined how actors within each action situation interact given doctrinal baselines and application of set, and in some cases modified, rules.

By exploring expected outcomes defined by adherence to doctrine, this chapter made certain assumptions based on what could conceivably occur under similar, if not identical, circumstances. In chapter 5, these analyses will form the basis for conclusions on CAS as an institution, and will provide recommendations for future study of this topic.

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<sup>1</sup>Elinor Ostrom, “Background on the Institutional Analysis and Development Framework,” *Policy Studies Journal* 39, no. 1 (2011): 11.

<sup>2</sup>Gibson et al., 24-25.

<sup>3</sup>Ibid., 25-27.

<sup>4</sup>Ibid., 26.

<sup>5</sup>Ostrom, 11.

<sup>6</sup>Ibid.

<sup>7</sup>Ibid., 12.

<sup>8</sup>Robert M. Cassidy, *War, Will, and Warlords: Counterinsurgency in Afghanistan and Pakistan, 2001-2011* (Quantico, VA: Marine Corps University Press), 43.

<sup>9</sup>Ibid., 43-44.

<sup>10</sup>Ibid., 48.

<sup>11</sup>Ibid., 48-49.

<sup>12</sup>JCS, JP 3-09.3, GL-15.

<sup>13</sup>Ibid., III-24.

<sup>14</sup>Ibid., III-31.

<sup>15</sup>Operational Control (OPCON) is the authority to perform those functions of command over subordinate forces involving organizing and employing commands; Tactical Control (TACON) is command authority over assigned or attached forces or commands, or military capability or forces make available for tasking, that is limited to the detailed and, usually, local direction and control of movements or maneuvers necessary to accomplish missions or tasks assigned.

<sup>16</sup>JCS, JP 3-09.3, V-19.

<sup>17</sup>Binney, 21-29.

<sup>18</sup>Ibid., 26-29.

<sup>19</sup>Ibid., 21-26.

<sup>20</sup>Department of the Navy, Chief of Naval Operations Instruction 3710.7U, *NATOPS General Flight and Operating Instructions* (Washington, DC: Chief of Naval Operations, 23 November 2009), letter of promulgation.

<sup>21</sup>Department of the Navy, *NATOPS Flight Manual Navy Model F/A-18E/F 165533 and Up Aircraft (A1-F18EA-NFM-000* (Washington, DC: Naval Air Systems Command, 15 September 2008), 51.

<sup>22</sup>Gibson, et al., 33.

## CHAPTER 5

### CONCLUSIONS AND RECOMMENDATIONS

The previous chapter described the interaction between CAS processes and its institutional components. Chapter 4 included a qualitative description of the CAS mission—including planning, execution, and some case study references—to frame the concept for the uninitiated reader and focus the discussion. The analysis continued by examining three specific subsets of CAS application where one can compare the intended outcome with the unintended consequences resulting from the interaction of actors in an environment under the umbrella of rules-in-use. This chapter will summarize the analyses from chapter 4 and form conclusions based on application of the IAD framework and professional inferences.

The existing body of work provided a framework for this particular study in that it steered the discussion away from simply making inferences based on hazard and incident reports, which have already been thoroughly analyzed. For most works on the subject of CAS employment doctrine, previous authors typically posited that because something bad happened, it was necessary to have better doctrine, and that was frequently the limit of the conclusion of each author. This study's intent was to look past the actual conduct of the CAS mission, positive or negative, and instead focus on the health of the institution based on the environment, actors, rules, and outcomes within action arenas.

Compared to similar works on the subject of CAS, this study is a significant departure from the status quo. There is no drawn-out analysis on decade-old case studies of fratricide or other critical procedural missteps; there is not a thinly veiled attempt to suggest that the doctrine is inadequate because people make mistakes and bad things

happen; and there is no parochial pedantry suggesting that one service does it better than another, and thus must become the lead agent for wide-sweeping change.

Instead, the methodology used in this thesis delved briefly into the foundations of CAS as a mission and skill set. This was to provide some basic context to the uninitiated reader in case future study makes use of this work. The goal of this qualitative analysis and description was to make this work accessible to scholars and not lock away potentially useful material behind a morass of military jargon. Secondly, in order to get to the root of the analysis on existing CAS execution—which indeed is what this study intends—this study had to examine not just what CAS is and what its practitioners do, but also why, and under what circumstances. This final point was to identify and examine the health and function of the institution in order to make inferences about whether or not it functions effectively as is, or if it could benefit from a scholarly recommendation for positive change.

The institutional analysis delved into three particular subsets of the CAS environment in order to discuss the health of the CAS institution, and identify incidents where perverse incentives existed and why. From here, this study crafts recommendations to mitigate the effects of perverse incentives and make the institution more self-aware and able to adjust to meet these unintended challenges.

The first subset, ROE in the close-in fight, examined the challenges of using CAS in an environment where an enemy has effectively discovered how to use the noncombatant population as a sanctuary from which to operate against friendly forces. In such an environment, small, agile forces with the ability to maneuver and integrate air support will be more effective against an omnidirectional threat. Commanders at all

levels should reinforce the need for ground forces to be adept at executing baseline troop tactics and not simply consider CAS an entitlement to take the place of basic warfighting.

Additionally, one could pose the question: Is CAS the most effective tool for attacking time-sensitive targets in and among a noncombatant population? This question implies yet another: Are commanders too risk-averse to use ground troops to prosecute targets of this nature, instead leaving them to aircraft, and therefore more exposed to the possibility of CIVCAS? It is certainly conceivable that the number of troops dedicated to a specific area is not sufficient to carry out the mission and simultaneously sustain an adequate level of security, owing much of their offensive reach to aircraft. Moreover, by allocating small ground units to root out high-value individuals taking advantage of noncombatant populations to hide, commanders expose them to omnidirectional threats, as enemy forces are less identifiable when operating from within their native populations.

The second subset dealt with problems of interoperability between services, and how those problems translate into confusion on the battlefield, and even ineffective performances related to CAS execution. The main point of this section was to highlight that, while JCAS doctrine exists and is “joint,” certain institutional factors degrade the optimal outcome offered by one joint doctrine. This problem is exacerbated by the advent of technologically advanced systems and weaponry designed, ironically, to make the employment of aircraft easier.

Whereas the American armed forces now typically operate jointly in most every endeavor, many technological systems—particularly those involving communication between aircraft or aircraft and ground personnel—are not effectively integrated, meaning that systems are either wholly incompatible or only partially so. Another factor

influencing the application of airborne capabilities on the battlefield is the myriad of so-called “smart” weapons whose existence, designed to improve the lethality and accuracy of friendly firepower, realistically imposes an unforeseen level of apprehension and restriction when actually employed. This is likely due to the fact that although the weapons are accurate within a very narrow margin of error, that accuracy depends highly on the quality of coordinates and other employment considerations, all of which being at the mercy of human performance, and therefore human error.

So the question becomes: If precision weapons are so great, why is there such a perceived apprehension for employing them? Additionally, if ground commanders and aircrew are nervous about their employment, why not just use a general purpose (or “dumb”) weapon? The answer lies in the disparity between the desired outcome of employing such weapons and their resemblance to dumb weapons when they fail or are employed incorrectly. It is not outlandish to say that modern commanders are risk-averse. The people in charge want a sure thing, and precision weapons help to mitigate the host of concerns with which they must contend: friendly losses, fratricide, CIVCAS, etc. The interesting and unforeseeable result of having precision weapons on the battlefield is that they virtually exacerbate this averseness to risk by making their failure exponentially less acceptable. Commanders will not nominally use unguided (“dumb”) weapons due to their relative inaccuracy, but that quality of high miss potential is already known. And when called to employ precision weapons, so many restrictions, checks, and double-checks are placed upon the delivering asset that the deliberate mitigation of failure sometimes becomes a self-fulfilling prophecy because of the starkly negative reaction to a failure of such a weapon.

The third and final subset explores the disparity between training and combat from a CAS execution standpoint. Specifically under attack is the ubiquitous “train like you fight” mentality that pervades the training environment. At work here is the unintended consequence of suboptimal performance in combat abroad given extensive training opportunities at home.

The differences identified between training and combat CAS execution, however, are largely unaffected by a baseline doctrine. The circumstances defining the training and combat environments are what drive the degree to which doctrine is disregarded in favor of technique. The repetitive nature of training is simply not enough to guarantee muscle-memory-like execution under conditions of extreme duress, such as those extant in combat operations. Instead, repetition and thorough evaluation of training events, something that should occur at every tactical unit, is the most effective vehicle for ensuring proper CAS execution when supporting the unit on the ground in combat versus within an exercise environment.

Arguably, one of the largest contributors to execution disparities between training and combat is the difference in incentives between the two environments. The training environment provides no life-or-death incentive, when compared to combat, for aircrew to perform at optimal levels. Examples of these incentives could include keeping the supported unit from sustaining casualties or eliminating a key enemy target. In training, the incentives in place are administrative in nature, and include proper care and operation of the aircraft, as well as accomplishing the training objectives within established standards.



One conclusion, therefore, based on these analyses is this: CAS is an effective tool for commanders when conducted by competent, well-trained aircrew; it is not, however, a one-size-fits-all tool for every battlefield or tactical situation. It is also not a substitute for basic ground tactics. To use a popular saying among operational forces, “if you always use a hammer (in this case, CAS), every problem starts to look like a nail.” The CAS institution has adapted itself to include such ROE-appropriate skill sets as Urban CAS to deal with the problem of enemies operating in and among noncombatant populations. But even so, the available offensive options from an attack aircraft are seldom surgical enough to guarantee no collateral damage or CIVCAS, all things being equal. If CAS were truly to adapt to this sort of fight, attack aircraft would need the capability of precision targeting with no collateral damage regardless of the proximity of collateral concerns. This is simply not a realistic situation given the current menagerie of weapons employed by combat aircraft, including IAM.

Secondly, the technology and weapons used in the CAS mission are always advancing and changing. This problem would be mitigated effectively if all branches of the armed forces used the same equipment, versions, variants, and so on. As discussed in chapter 4, the problem of weapon and system interoperability implies additional coordination between CAS assets, planners, and controllers, which detracts from actual execution. In addition, whereas these interoperability problems are not insurmountable, their absence would most certainly improve the ability of all service branches involved in the CAS mission to execute it more seamlessly. Perhaps this study will serve as a datapoint for future inquiries into acquisition processes regarding how the joint force is equipped with compatible systems.

A final conclusion is that the CAS mission is taken seriously by its practitioners, and that training situations do attempt to replicate combat as much as possible. However, even though training scenarios are designed to inject realism into a flight event, there is simply no way to adequately replicate the stressors of actual combat. Institutionally, this cannot be helped, but trained JTACs and Forward Air Controller (Airborne) are capable of both simulating plausible enemy activity and promoting strict doctrinal execution within a training environment. This helps provide aircrew with some simulated combat stress, but focuses on adherence to procedures in order to ensure that when in combat they are executed by muscle memory.

#### Final Thoughts and Thesis Conclusion

This study focused on institutional aspects of the CAS mission, including planning, execution, and inter-service coordination in training and in combat. In general, existing processes, doctrine, and practices are effective in achieving mission success in a variety of environments under various circumstances. Notwithstanding human error or deviations from established doctrine, JP 3-09.3 forms a solid foundation for the CAS mission, and is institutionally sound in terms of regular review, relevance, and effectiveness

Where the underlying institution could benefit is in a close look at more adequate CAS-like procedures for very restrictive ROE environments. A key question could be whether or not air power is appropriate for these types of environments, or if aircraft (or remotely-piloted aircraft) should only be on station for emergency support situations where collateral concerns become secondary to loss of friendly life. Moreover, although resource constraints largely restrict the available “realism” of training environments,

perhaps JP 3-09.3 should include a chapter on training which focuses specifically on building, reinforcing, and maintaining critical combat skill sets. In other words, allow the institution itself (i.e., the institution responsible for promulgating joint doctrine) to determine appropriate training metrics, and delegate service-specific details downward as required. If JP 3-09.3 effectively sets that standard, then individual services' training supplements will nest within the parent doctrine. This shifts the burden of oversight onto the joint institution, leaving individual services the ability to tailor specific and specialized training requirements based on their capabilities.

The whole of the joint force will never truly be able to operate jointly until systems and processes are fully compatible. With the multitude of private, for-profit business developing systems for military use, it is virtually impossible to ensure full compatibility across a wide range of platforms and needs. I propose that a new look into acquisitions and systems development be considered to ensure that the joint force is equipped with the technology and weapons it needs to fully integrate anywhere, anytime.

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